REMARKS

The specification has been reviewed, and clerical errors are corrected.

In paragraph 5 of the Action, a new title was required. Accordingly, the title of the invention has been changed.

In paragraph 2 of the Action, claims 1-9 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite.

In paragraph 7 of the Action, claims 1-4 and 6 were rejected under 35 U.S.C. 102(b) as being anticipated by *Yamada et al.* (JP 2001-117058) or Applicant's Prior Art shown in Figs. 4 to 7.

In paragraph 8 of the Action, claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over *Yamada et al.* (JP 2001-117058) or Applicant's Prior Art shown in Figs. 4 to 7.

In paragraph 7 of the Action, claims 5, 8 and 9 were objected to, but indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In view of the rejections, claim 1 has been amended to clarify the features of the invention. New claims 10 to 13 have been filed to obtain proper scope of the invention.

With the amendments, the application is believe to be in the allowable condition for the reasons explained below.

As recited in amended claim 1, an optical semiconductor device of the invention comprises: a substrate; a semiconductor laser including a lower clad layer, an active layer, and an upper clad layer formed in this order on the

substrate; an electroabsorptive modulator including the lower clad layer, a light absorption layer, and the upper clad layer formed in this order on the substrate; and a separation region provided between the semiconductor laser and the electroabsorptive modulator. The separation region includes the lower clad layer, a wave guide layer, and the upper clad layer formed in this order on the substrate.

Further, in the optical semiconductor device, the upper clad layer extends from the semiconductor laser through the separation region to the electroabsorptive modulator. The electroabsorptive modulator receives light generated from the semiconductor laser in a wave guide direction through the wave guide layer. The semiconductor laser, separation region, and electroabsorptive modulator each has a side provided in parallel with the wave guide direction of the light. The upper clad layer extends in a direction crossing the wave guide direction up to the side of the separation region.

In the optical semiconductor device, when the light absorption layer of the electroabsorptive modulator absorbs the light from the active layer of the semiconductor laser through the wave guide layer of the separation region, a large amount of heat is generated in the separation region. In the invention recited in claim 1, the separation region provided between the semiconductor laser and the electroabsorptive modulator includes the upper clad layer. The upper clad layer extends in a direction crossing the wave guide direction of the light up to the side of the separation region. Accordingly, through the upper clad layer, it is possible to effectively radiate heat from the separation region to outside the optical semiconductor device.

Yamada has disclosed an optical semiconductor device with a large input light power. As the examiner pointed out in the

Action, in Fig. 35 of *Yamada*, an optical semiconductor device comprises a substrate 10; a semiconductor laser 500; and an electroabsorptive modulator 120; and a separation region 100. The separation region 100 includes a lower clad layer 20, a wave guide layer 30, and an upper clad layer 40. According to *Yamada*, the semiconductor laser 500 and the electroabsorptive modulator 120 have a common channel 60. The channel 60 has a narrow portion in the separation region 100, so that the upper clad layer 40 has a wider width (col. 66). In other words, the upper clad layer 40 is separated by the channel 60, and does not extend continuously relative to a wave guide direction from the semiconductor laser 500 to the electroabsorptive modulator 120.

On the other hand, in the invention recited in claim 1, the upper clad layer continuously extends in a direction crossing the wave guide direction from the semiconductor laser to the electroabsorptive modulator up to the side of the separation region. Accordingly, through the upper clad layer, it is possible to effectively radiate heat from the separation region to outside the optical semiconductor device. In *Yamada*, there is no disclosure or suggestion regarding the upper clad layer continuously extending in a direction crossing the wave guide direction from the semiconductor laser to the electroabsorptive modulator up to the side of the separation region. Therefore, the invention recited in claim 1 is not anticipated by *Yamada*.

In the specification of the application, Figs. 5 and 6 show conventional EA-DFB devices as Prior Art. As shown in Fig. 5, the conventional EA-DFB device includes a DFB laser (LD) 41 and an EA modulator 42 formed on a substrate. A separation region 43 is provided between an upper electrode 46 of the LD

41 and an upper electrode 48 of the EA modulator 42. In the separation region 43, the lower clad layer 53, a wave guide layer 55, the upper clad layer, and the ohmic contact layer are formed in this order on the substrate 52. Further, an etched channel 49 is provided on sides of the LD 41 and the EA modulator 42 so as to form a ridge structure. In other words, the upper clad layer is separated by the channel 49, and does not extend continuously relative to a wave guide direction from the LD 41 to the EA modulator 42. Accordingly, Fig. 5 does not show the upper clad layer continuously extending in a direction crossing the wave guide direction from the semiconductor laser to the electroabsorptive modulator up to the side of the separation region.

Fig. 6 is the same figure as Fig. 35 in *Yamada* except reference numerals. For the reason same as that described above, Fig. 6 does not show the upper clad layer continuously extending in a direction crossing the wave guide direction from the semiconductor laser to the electroabsorptive modulator up to the side of the separation region.

As explained above, Prior Art shown in Figs. 5 and 6 in the specification of the application does not anticipate the invention recited in claim 1.

As recited in new claim 10, an optical semiconductor device of the invention comprises: a substrate; a semiconductor laser formed on the substrate and including an active layer for generating a laser beam in a beam direction; an electroabsorptive modulator formed on the substrate and including a light absorption layer for receiving the laser beam from the semiconductor laser to generate an electrical signal; a separation region formed on the substrate between the semiconductor laser and the electroabsorptive modulator; and a slab disposed in the separation region for radiating

heat. The separation region has side portions extending in parallel to the beam direction. The slab extends continuously from one of the side portions to the other of the side portions in a direction crossing the beam direction.

In the optical semiconductor device, when the light absorption layer of the electroabsorptive modulator absorbs the light from the active layer of the semiconductor laser through the separation region, a large amount of heat is generated in the separation region. In the invention recited in claim 10, the slab is provided in the separation region between the semiconductor laser and the electroabsorptive modulator. The slab extends continuously from one of the side portions to the other of the side portions in a direction crossing the beam direction. Accordingly, through the slab, it is possible to effectively radiate heat from the separation region to outside the optical semiconductor device.

As explained above, in *Yamada*, there is no disclosure or suggestion regarding the slab continuously extending from one of the side portions to the other of the side portions in a direction crossing the beam direction. Therefore, the invention recited in claim 10 is not anticipated by *Yamada*. Also, Figs. 5 and 6 in the specification of the application do not show the slab continuously extending from one of the side portions to the other of the side portions in a direction crossing the beam direction. Therefore, Prior Art shown in Figs. 5 and 6 in the specification of the application does not anticipate the invention recited in claim 10.

As explained above, *Yamada* and Prior Art shown in Figs. 5 and 6 do not disclose nor suggest all the features of the invention recited in claims 1 and 10. Therefore, the invention is not anticipated by *Yamada* and Prior Art

disclosed in the specification of the application. Even though these references are combined, the invention is not obvious.

Reconsideration and allowance are earnestly solicited.

Respectfully submitted,

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